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ABSTRACT

An educational program based upon information processing theory has been developed at Southern Illinois University. The integrating theme was the development of conceptual ability for coping with social and personal problems. It utilized student information search and concept formation as foundations for discussion and judgment and was organized to permit interdisciplinary efforts, provided that a common set of problems was selected which allowed students to use the knowledge, concepts, and procedures of the participating disciplines. The first implementation of the program was in the Management Problem Laboratory (MPL). A group of 80 junior year business majors taking core courses in management, computer programing, economics, marketing, statistics, accounting, and finance focused on a selected topic. They conducted information searches, formulated multiple hypotheses, and developed reports. Evaluation indicated that such students were equal to a matched group of students in the regular program in the acquisition of knowledge, even though student-instructor contact was reduced 50%; the experimental group also showed a significantly greater increase in conceptual ability and motivation. (Author)

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INFORMATION PROCESSING THEORY AND CONCEPTUAL DEVELOPMENT

H. M. Schroder

Introduction

Conceptual development, in any domain is broadly defined as to movement away from the use of externally given evaluative concepts in judgment and decision making toward more complex information processing whereby a person searches for information and actively combines attributes or kinds of information in different ways thus forming multiple concepts. A concept represents a way of construing a stimulus (e.g., a person or an event); it is a perspective or a reality - a way of selecting, perceiving, evaluating and behaving. Such realities can be delivered to us ready-made (i.e., concepts can be externally anchored) or they can be self generated by combining two or more attributes of information. Environments for concept development foster the self generation of multiple concepts or realities as tools for thought and judgment (Schroder, Driver & Streufert, 1967; Schroder, Karlins & Phares, 1973), e.g., as a basis for making occupational judgments.

Conceptual development - this self generation of multiple concepts - is the most challenging and formidable endeavor an individual can undertake. Under conditions of accelerated change and accompanying uncertainty there is an increasing tendency to reduce this uncertainty by latching onto a ready-made reality (a ready-made way of perceiving and behaving in the new situation). In this way we can quickly return to the comfort and a false sense of feeling of self control.

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The history of western man can be viewed as the development and supremacy of those institutions which were able to provide him with ready-made realities for coping with the stress of change. Initially, man worshipped to be controlled, he worshipped for an external anchor to give him comfort and support in a world whose events he did not understand. In the course of events those with power capitalized on this need by providing "realities" which the masses adopted. These concepts were skillfully designed to achieve the goals of leaders and institutions (for example, in regard to work, family organization, conduct) to keep the masses under control and working in the interests of the elite (e.g. see the history of the Reformation). Over time - and through revolutions - more and more of the masses sought and won the right to impose their own "realities." Today it has become a complete science with a large proportion of our resources devoted to the creation and the imposition of "realities" through more and more sophisticated means of manipulation (behavior control, norms).

The imposition of externally generated concepts is a very, very effective means of controlling and/or imposing change on individuals, groups and nations. Authorities and institutions can direct or change people easily and quickly - it is simply a matter of prescribing a reality and using behavior control methods to ensure the prescription is adopted. The effect of increasing democratization has been to permit a wider range of "authorities," who possess the rewards needed to prescribe and impose realities. In fact, democratization has accelerated the movement of the masses toward the adoption of an externally anchored self. As Fromm so well described - under conditions of uncertainty people "escape from freedom." In our terms they escape from the "risks" involved in self change and are overly motivated to adopt ready-made or ready-packaged realities and the promised rewards.

Our educational institutions have also capitalized on this method of achieving individual change or "development." Students are essentially given prepackaged concepts and procedures (via the textbook and lecture technology supplemented by teaching machines and other supports) and are rewarded for utilizing these concepts in approaching problems during and at the end of their courses. Occupational choice is often made on the basis of an externally prescribed reality - by norms or a parent - which is alien to the individual's self.

So, in the latter part of the 20th Century the nature and direction of self-change (socially and educationally) is largely determined outside of oneself and these externally determined goals were not designed to be concerned with the intrinsic welfare of the individual (Schroder & Crocker, 1973). Thus, despite the materials and economic advances the externally anchored system provides, the individual continues to feel a lack of identity, a lack of self or internal control, an inability to experience himself or events directly and a general lack of intrinsically aroused interest and excitement.

Conceptual Development

Concept training provides an individual with the tools for internally anchored thinking and self-generated change. The aim of concept training environments is to develop the conceptual processes involved to achieve a balance between the internally and externally anchored systems of development and change.

Conceptual development implies an increase in information processing activities of the individual. It is defined as the self generation and utilization of an increasing number and informationally rich concepts persons

use in thinking and judgment in any domain. That is, conceptual development is defined in terms of:

1. The number of concepts or perspectives a person uses, e.g., in the educational domain it is defined as the use of multidisciplinary concepts (economic, social, financial, psychological, organizational) in making judgments about societal problems; in the interpersonal domain as the use of multiple conceptions (intellectual, social, task) in making judgments about other people; and in the occupational domain as the number of concepts (e.g., regarding job opportunities, skills, motivation, interests) the person uses in making occupational choices.
2. The informational richness of each concept. A concept combines the various attributes (or scale values) or information (Warr, Schroder & Blackman, 1969). Some concepts have little informational support, for example, concepts based on a single attribute of information about another person such as skin color or belief. On the other hand, more enriched concepts are formed on the basis of many kinds of information - belief, interest, knowledge, and so on.

At higher levels of conceptual development persons: (a) generate or search for more kinds of information, (b) form multiple concepts on the basis of this information and (c) utilize these multiple concepts in judgment and thinking. Like other abilities, conceptual development need not be at the same level in all domains. Persons can, as a result of their training, be high in one area (e.g., in conceptualizing about

themselves or other people) and low in another (e.g., in conceptualizing about religion). That is, a student could develop to a higher level of conceptual functioning in mathematical subjects than in social science subjects when amount of knowledge acquired in each was constant (Schroder, et al., 1973).

Higher levels of conceptual development in one domain implies a greater number of perceptual categories for receiving information about the world, and more combinatory rules or concepts for organizing such units of information. When we speak of a person possessing "a greater number of perceptual categories for receiving information about the world" we are referring to his ability to generate more information relevant to his needs. When we refer to "more combinatory rules for organizing such units of infomration" we are speaking of the individual's ability to form multiple concepts on the basis of this infomration and to use these concepts or hypotheses in a creative manner in problem solving. These two hallmarks of well developed information processing skills - information generation and concept formation (and utilization) - represent the criteria for conceptual development. (Schroder, Karlins & Phares, Education for Freedom, 1973)

Definition of Concept Training Environments:

A. Operations for Laboratory Training Procedures

Laboratory studies have shown that individuals can be directly instructed to form multiple informationally rich concepts and to utilize these more complex conceptual properties in judgment (Schroder, 1971; Faletti, 1968; Lee, 1968; Carrington, 1968; Gardiner, 1972). In these studies, subjects were given attributes of information (intelligence,

empathy, assertiveness, thoroughness) about applicants for a hypothetical position. They were instructed to form concepts about the applicants based on two or three scale values (ratings on attributes). This variation in the number of attributes used in concept formation defines variations in informational richness. Groups of subjects were also instructed to form either one or two concepts using the same scale values of information for each concept, for example, to form one concept from a social perspective and one from a task perspective. Different concepts represent different weightings of attributes. This defined differences in the number of concepts. A total of approximately eight (8) hours training time was given in four weekly sessions. Subjects then used either single or multiple concepts (varying in informational richness) to make judgments about the applicants. These judgments demonstrated that variations in direct concept training did produce expected differences - namely that the formation of multiple informationally rich concepts is expressed in judgments in the specific training situation.

B. Operations for Field Training Procedures

In order to develop field process or concept training environments it is necessary to design the training situation so that the trainee must learn solely through exercising the processes required for the development of multiple informationally rich concepts - that is, through the use of the two related operations specified above, namely, (1) information generation and (2) multiple concept formation and utilization in judgment.

The field training environment, then, must be designed so that the trainee can, and in fact must, reach his goal, e.g., occupational choice, via:

1. Information search - the generation of many kinds (attributes) of information about the stimuli (e.g., self) and
2. The formation of multiple concepts on the basis of differential weightings of this information.

The utilization of multiple concepts or hypotheses in judgment and the consequent generation of descrepant feedback arouses intrinsic interest or interest in the task for its own sake - which is an essential property of any effective concept or process training environment (Hunt, 1971; Berlyne, 1965). That is, concept training is a process of learning through concept development, information search, feedback and concept modification.

The training format described in this paper was implemented in an academic program. Our interest here was mainly to study conceptual, motivational and educational development in this environment. However, from a theoretical viewpoint we expect that "process environments" in education will facilitate the maturity of judgments about self, e.g., occupational judgments. Dr. Schutzius (in the next paper) will specify the factors in this environment which are most relevant to "self" growth, e.g., learning to search for relevant information and forming self generated multiple concepts; using self-made concepts to approach a variety of real world problems, forming and using interdisciplinary concepts, working cooperative toward shared goals, and working independently in developing the conceptual processes. This work is described in a new book called Education for Freedom published by Wiley and Sons, 1973. We have begun to develop a concept training program for individuals in the area of occupative judgment. But this is still in the early developmental stages.

DESCRIPTION OF THE CONCEPT TRAINING MODEL

R. Schutzius

Thus far, we have talked about concept training and the importance of creating environments for concept development. In my presentation I would like to share with you our first attempt at developing such an environment in an ongoing university program.

The Management Problem Laboratory Program (MPL)

The Management Problem Laboratory Program (MPL) originated at Southern Illinois University in Edwardsville in the 1970-71 academic year with a group of 80 juniors who were beginning their first year as business majors. Twelve junior courses are taught over three quarters, all required for business majors. The courses cover management, computer programming, economics, marketing, statistics, accounting and finance.

The concept training environment centers around the problem laboratory which contains factual data concerning selected real world problem areas. A different problem is selected each quarter such as, an urban housing community, a quick food franchise, and an automobile dealership. The students at the beginning of each quarter are given a problem statement which requires application of the principles under study in the four courses to the data they can obtain from the problem laboratory. Students are to make recommendations in a written report due at the end of the quarter on strategies for solving the problems under study, by gathering data through forming and submitting written questions to the problem laboratory operators who retrieve the requested information. They carry out their own information search and use the data obtained to develop ideas and write reports. It is a process of learning through concept development, i.e. (formation of an

idea as to what might be the source of the problem), information search (information requested from the problem laboratory), feedback and concept modification (on the basis of the information received the original idea is changed, confirmed or discarded and new ideas generated to be tested by further information search, feedback, etc.).

The actual implementation of this took some doing. Fortunately, we were given the resources to bring it all about. Well in advance of the first day of class, the participating professors of that quarter carefully select a problem statement which require the student to apply all the concepts or knowledge of each course in writing of one comprehensive report which would give recommendation for solving the problem. The professors then list the data which they feel might be required to deal with the problem. The data is then collected by an assistant in cooperation with the participating organization whose business problems are under study. The above tasks require maximum effort each in themselves. For instance, in the urban apartment complex, the professors must agree on a single problem statement, a list of data needs must be compiled, and literally thousands of units of data must be generated including demographic data, data on existing and past tenants; financial, economic, marketing, legal and accounting records, data on community facilities, recreation and crime, data on the area, industry, universities, schools, zoning, social political climate, transportation, etc. The data is then organized and stored as an information library or data library in the problem laboratory. Thus we have the informationally rich environment necessary to focus education on the process or conceptual development.

At the beginning of the quarter, the problem is presented to the students who then must formulate written questions in order to retrieve data from the data library. Only questions which seek data can be answered. Initially, the students ask evaluative questions such as "Is service to the people adequate?"; but soon discover that they must arrive at their own evaluative judgements based on factual data. In the beginning they find it difficult to form ideas or concepts and tend to engage in more or less random information search. Questions are submitted on a special form which ask the student: a. to state his idea, concept or hypothesis about the problem, and b. to list relevant questions. The full meaning of what the form requests is usually not understood until the overload of information begins to force the development of an idea or hypothesis as a basis for guided search. As skills improve the students begin to formulate alternative hypotheses and seek data with a greater range of relevance. The students are formed into groups of five where data individually or collectively obtained can be discussed and concept evaluated. Each individual is encouraged to use the team as a support for developing his report. Since team members have a common problem and goal, small group interaction is stimulated and the processes of concept development facilitated.

The criteria for grading include the process of concept formation as well as the context. All course instructors grade the single report which each student submits. Preliminary reports are called for to give feedback to the students from the instructors but these are not included in the grading. Instructors are trained to grade the reports on this criteria. The first is knowledge which is defined as how well the students apply the

concepts and content of each course to the problem. The students are specifically instructed to consider all knowledge (from lecture, texts and additional readings) in dealing with the problem and to report on its relevance. Each instructor grades each report on the breath and understanding of the knowledge of his course used in dealing with the problem. The second criteria is concept formation and utilization. This includes the number, differentiation and statement of concepts ideas of hypothesis formed about the problem. The third criteria is information search. Each instructor rates the amount of information and data searched and considered in relation to concept development, modification, and multiple concept utilization in making recommendations in the report. Students are instructed as to the details of the grading.

Usually, a student will undertake at least four courses each quarter. These courses cover the disciplines of accounting, business administration, economics, finance, management science and marketing. One one-hour lecture and one on-hour class is allocated to each course per week. In addition, each student attends two one and one-half hour interdisciplinary problem laboratories per week. That is, for the regular four course program in each quarter, students attend four hours of lectures, four hours of class work and three hours of management problem laboratory. The total of 11 hours of required course work is approximately 30 per cent less than the 16 hours of class work in the regular program. However, three of the eleven hours involve independent MPL work so that the instructor-student contact is reduced by 50 per cent as compared to the regular program. In addition to the four courses each quarter, three optional courses are offered on a continuing basis, i.e., over a three quarter period.

The Counselor's Role

A coordinating counselor was part of the staff for the pilot program and his skills were put to good use. The level of uncertainty and frustration in the students ran quite high since they were unaccustomed to learning through generation of their own questions and hypotheses. In their previous educational experience they received prepackaged ideas to be studied and internalized. Not given these, they needed structure and reassurance until enough confidence is developed in their own internal conceptual resources. The program is designed to be flexible so as to adapt to student needs. The counselor was to be aware of these needs and make recommendations for program changes and facilitate their implementation. The faculty too, were as unaccustomed to the formal as were the students, and the counselor was helpful in working out the compromises required to reconcile faculty, student, and program needs. In the area of measurement, he worked closely with the research team in obtaining data about student change and growth. A series of studies of the relative effectiveness of the described concept training program has begun and the results of several are now known.

Other Educational Perspectives

Growth

As the students develop their multiple concept utilization skills in business areas there takes place some transition of these skills in other areas. Personal decisions and life styles long established undergo re-evaluation. The counselor is helpful in this area as one with whom the new insights can be shared and explored without threat.

Choice

The interdisciplinary aspect and real world structure of the problems enable the students to see more clearly just what the business world is all about. This knowledge is enough for some to quickly change their major from business and for others to further determine their specialization in the business world.

Cooperation Versus Competition

At first the students are quite guarded with the data they have obtained from the data library and ideas that they individually have. Over the three quarter period, we find that this individual competitive approach breaks down within the team and then between teams in favor of cooperation and sharing of insights.

Cumulative Enrichment

The role of the instructor is somewhat changed in this environment. While he presents his course material he also is involved in the problem formulation; data acquisition and he acts as consultant to the students. As the program continues, the expertise of the different instructors remains to be improved on by new instructors. Since the problem is interdisciplinary the instructor interdisciplinary experience is tapped by the students. As a result of the cumulative effect and interdisciplinary approach learning in

the program is less and less dependent on the charisma of the individual instructor.

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